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Advisory Committee on Heavy Oil and Oil Sands Development

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Alberta
ENERGY AND NATURAL RESOURCES

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ENERGY AND NATURAL RESOURCES

Office of the Minister

Legislature Building, Edmonton, Alberta, Canada T5K 2B6 403/427-3740

September 30, 1985

To Her Honor
Helen Hunley
Lieutenant-Governor
Province of Alberta:

Madam:

I have the honor to transmit the Second Annual Report of the Advisory Committee on Heavy Oil and Oil Sands Development.

Respectfully submitted

John Zaozirny
Minister of Energy and Natural Resources

LEGISLATIVE ASSEMBLY
ALBERTA

September 30, 1985

To The Honorable John Zaozirny
Minister of Energy and Natural Resources

Sir:

I have the honor to transmit the Second Annual Report of the Advisory Committee on Heavy Oil and Oil Sands Development.

Respectfully submitted

J. E. (Bud) Miller, MLA
Chairman

Statement of the Chairman

The second year of the Advisory Committee on Heavy Oil and Oil Sands Development has been marked by significant progress. Some important and exciting projects were announced during the year, confirming the expectation and faith that industry has for this Alberta resource, and for the first time in several years, commercial projects have been initiated.

The number of experimental and exploratory sites in the heavy oil and oil sands deposits still serves to illustrate the competitive and intense interest shown by the petroleum industry. At recent count, there were more than 60 experimental test sites and projects operating. There is, and will be for years to come, a continuing need to learn more about our heavy oil and oil sands deposits and the technology associated with extracting and upgrading the resource. The Alberta Oil Sands Technology and Research Authority (AOSTRA) continues to make a significant contribution to this search for improved technology. Continued optimism about underground mining projects for shallow in situ recovery has prompted AOSTRA to develop an underground test facility north of Fort McMurray. This bold new step will be watched with interest and anticipation by industry, as it is hoped this will introduce a new approach in recovering oil where the amount of overburden makes the cost of open pit mining of the oil sands prohibitive. Concern about world oil prices and their effect on the viability of heavy oil and oil sands projects has been in the forefront of industry decision-making during the past year. However, the long-term optimism of the developers has prevailed. The fact that Canadian conventional supplies are decreasing rapidly has not changed. One of the acknowledged replacement sources will be the vast heavy oil and oil sands deposits of Alberta.

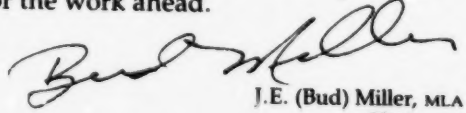
Heavy oil and oil sands production cannot be turned on and off as easily as can conventional oil production. Therefore, long-term planning must prevail over short-term reaction to current headlines.

The committee has been particularly impressed by the municipal governments in the new resource areas, their preparedness for growth and ability to cope with the problems and stress rapid growth can bring. The experience of the past years in Alberta's growth centres has left them with an air of confidence in their ability to handle most situations.

The committee has also noted the remarkably open communication between industry and the community. Willingness to discuss a situation, acknowledge concerns, be flexible and show understanding has become the norm between most industry developers and communities, minimizing the confrontations often associated with this scale of development.

Without close monitoring, growth-related activities may easily overload services and create problems which may be avoided if action is taken in time. To this end, the committee has established a quiet and continuous communication between industry, community and government. When difficulties have arisen, the committee has recommended and requested action and review by appropriate agencies.

The continual progress in the search for technology and development of this massive natural resource is an exciting part of our province's present and future. The maturity of Alberta communities and industry is a source of pride that surely must instill confidence in those who plan for the work ahead.



J.E. (Bud) Miller, MLA
Chairman

The Role of the Committee

The Advisory Committee on Heavy Oil and Oil Sands Development was established under the Department of Energy and Natural Resources Amendment Act, 1983 (Revised Statutes of Alberta, 1983, C. 24). The legislation received royal assent on June 6, 1983, and the committee held its first meeting the following month, in Edmonton.

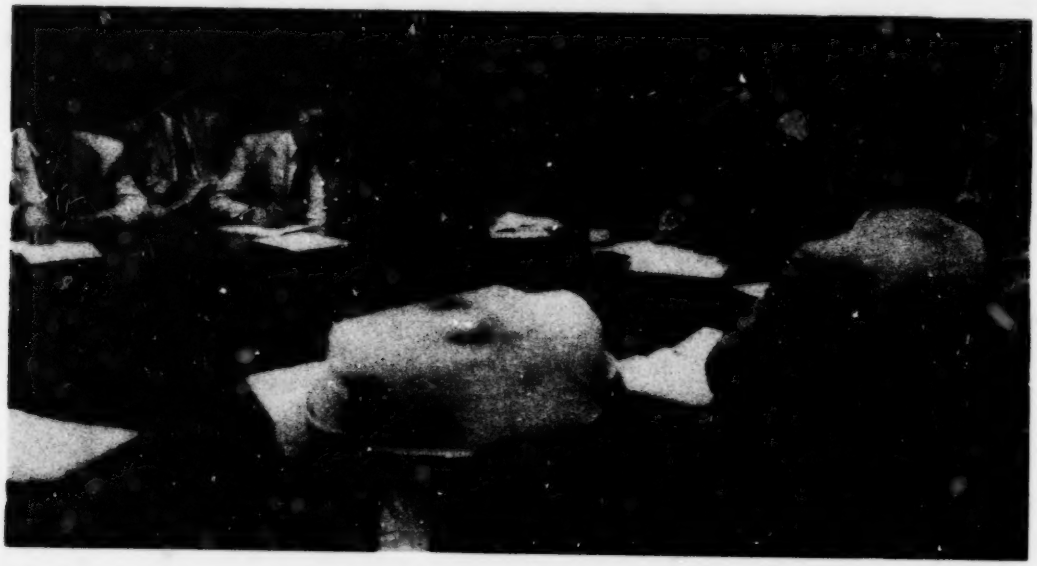
In recognition of the impact on communities of accelerated growth due to heavy oil and oil sands development, the committee was formed to monitor such activity and to anticipate growth problems.

The Advisory Committee provides a continuing liaison between the Government of Alberta and the representatives of communities that are or may be affected by such development.

It will advise the government on the timing of the implementation of government programs providing public services and facilities in areas of Alberta affected by the further development of heavy oil or oil sands resources, in keeping with the pace and scale of that development.

As well, the committee will hear and review the concerns of residents in the vicinity of these proposed developments about the possible effects of such developments on communities, bringing those concerns and suggestions to the attention of the government so they may be dealt with in a co-ordinated manner.

In general, it encourages continuing communication among the organizations engaging in the business of the further development of heavy oil and oil sands resources, the residents of communities of Alberta directly affected by that development, and the various departments and agencies concerned in its regulation.



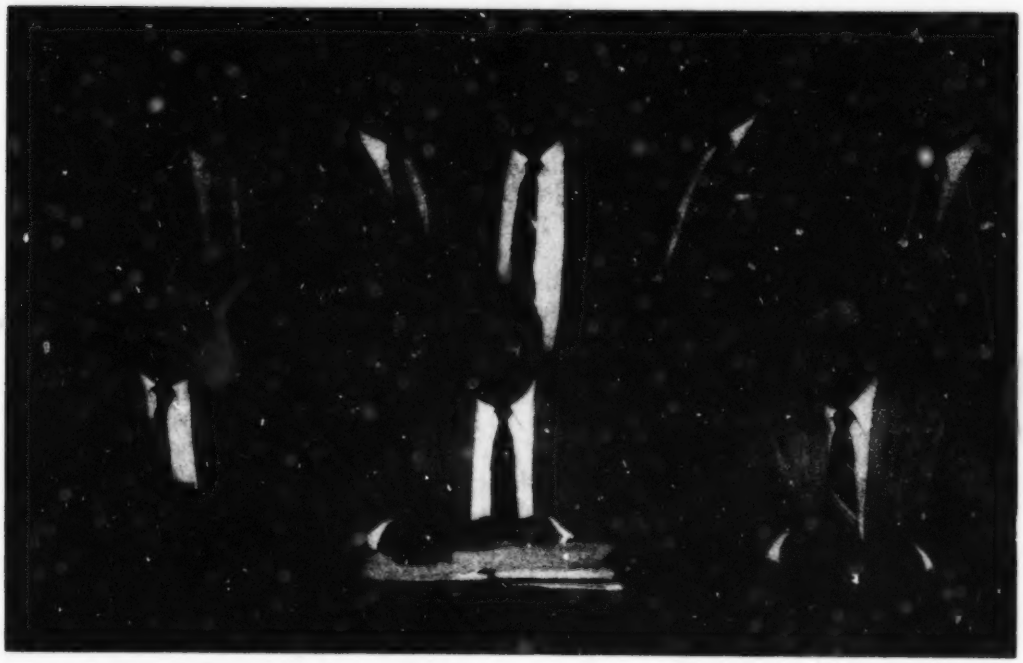
Committee Membership

The legislation which established the Advisory Committee on Heavy Oil and Oil Sands Development also prescribes its membership to ensure balanced representation.

The chairman is a member of the Legislative Assembly of Alberta. Three members are appointed to represent residents of heavy oil and oil sands areas. Industry, the Energy Resources Conservation Board and Alberta Energy and Natural Resources are also represented.

These individuals bring to the committee's work a great deal of experience, expertise and insight related to the technology and socio-economic impact of heavy oil and oil sands resource development in Alberta.

The Advisory Committee on Heavy Oil and Oil Sands Development



Members of the Advisory Committee on Heavy Oil and Oil Sands Development: *Seated (left to right)*: Neil Gilliat, Slave Lake; J.E. (Bud) Miller, M.L.A., Chairman; Dick Aberg, Industry. *Standing (left to right)*: Don McGladdery, Fort McMurray; Ralph Evans, Energy Resources Conservation Board; Bill Slawuta, Bonnyville; Norm Gaelick, Executive Director; Les Cooke, Alberta Energy and Natural Resources.

Resources and Development

As Alberta's conventional light oil reserves decline, the production of bitumen and synthetic crude oil from oil sands and heavy oil is being stepped up to take their place.

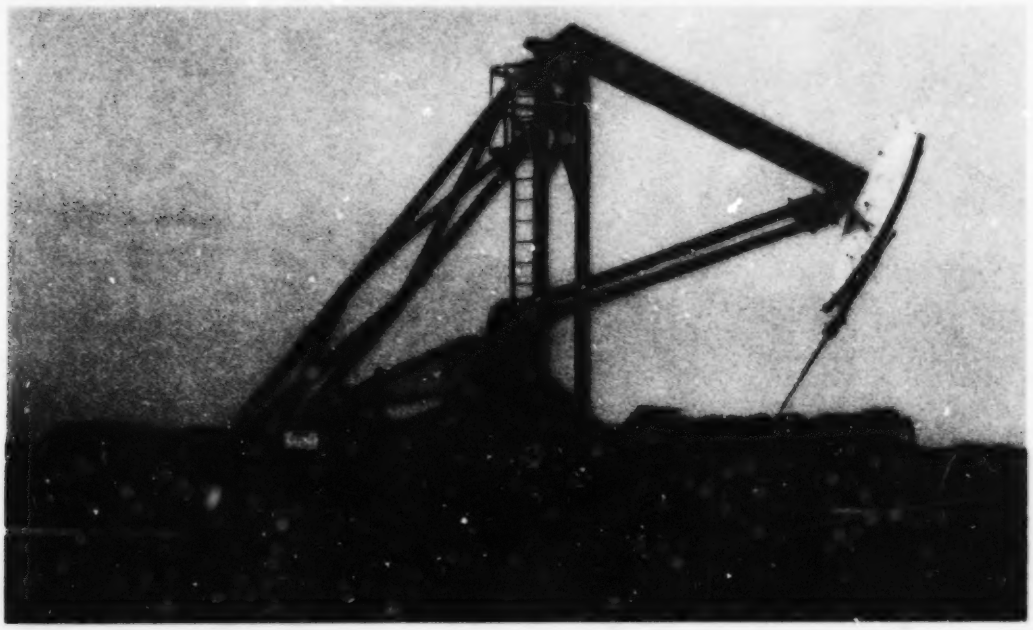
Within the next decade, these resources are expected to outstrip conventional light oil production, and the Energy Resources Conservation Board (ERCB) forecasts that by the year 2005, bitumen and synthetic crude will represent two-thirds of the province's oil supply and be equal to current levels of light oil production — about 150 000 cubic metres per day.

The ultimate potential reserves of crude bitumen in Alberta are now estimated at 400 billion cubic metres, with ultimate recoverable volumes very conservatively estimated at 46 billion cubic metres — seven billion cubic metres from surface mining and 39 billion cubic metres from in situ production.

Crude bitumen occurs in two basic geological settings, the "loose" or unconsolidated sands of the Cretaceous Age, and the older Paleozoic limestones or carbonate formations. The majority of the known in-place reserves, and by far the greatest amount of commerical and experimental exploration to date, has occurred in the Cretaceous deposits.

These oil sands consist mainly of sand, bitumen (the heaviest, thickest form of petroleum) and water. Bitumen and water occur in the pore spaces among the grains of sands. The three major oil sands deposits in Alberta are the Athabasca, Cold Lake and Peace River sands.

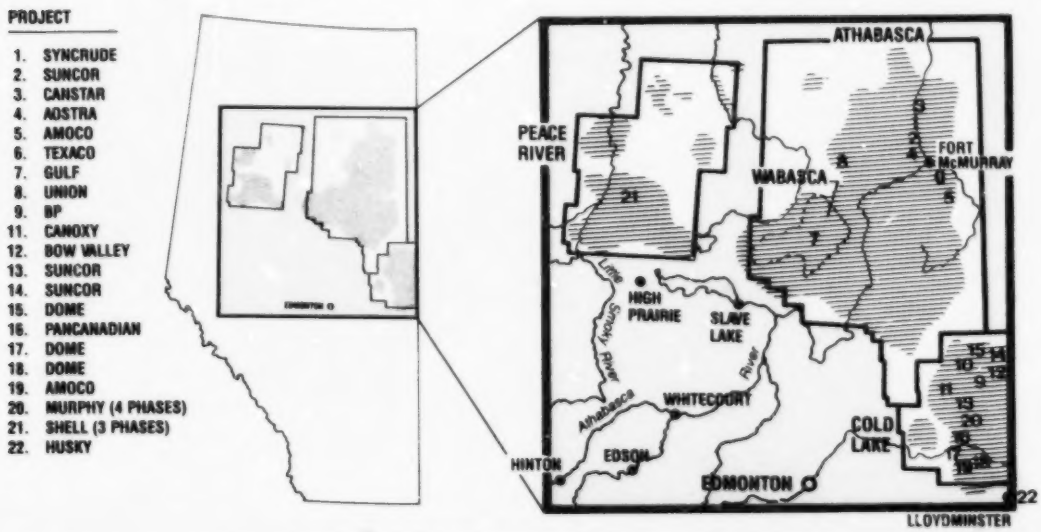
The two recovery methods used in Alberta are open pit mining, where the bitumen is found close to the surface, or in situ recovery techniques, most of which involve applying heat (through the injection of steam, for example) so that the bitumen can be pumped through wells to the surface.



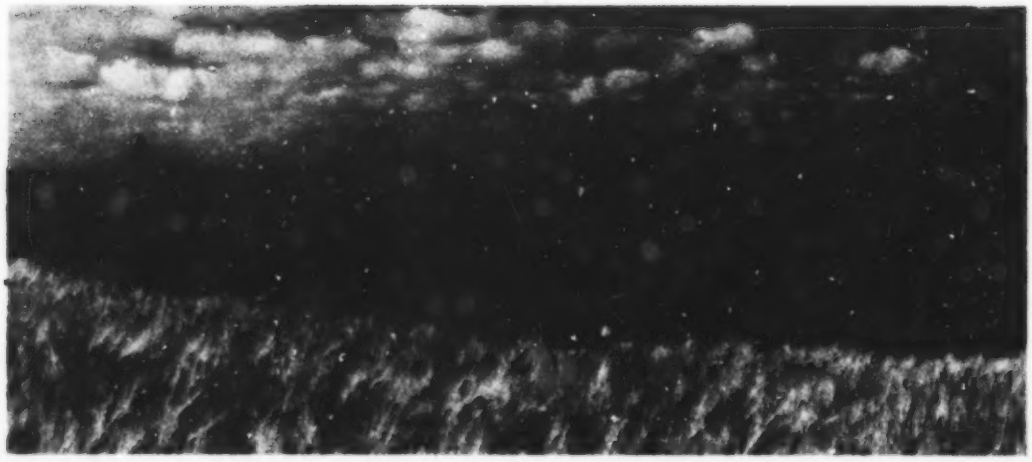
While the heavy oil and oil sands resource activity has already brought great economic development to several areas and will mean several thousand new jobs by the end of the decade, there are potential and actual costs associated with it as well. Development can create conflicts with economic activities already established in the region, such as construction or small industries which must compete for skilled labor, and forestry, agriculture or trapping which must compete for land. Rapid population growth can also bring social and environmental problems. In order to optimize the economic and social returns from the development of our energy resources, co-operation among industry, local municipalities and the provincial government is needed.

This year, two new commercial in situ plants were brought on stream, and approval was received and construction commenced on two others. Esso Resources Canada Ltd.'s Cold Lake project was initially applied for in 1978, as a megaproject with a target production of 25 000 cubic metres per day. The project would have included an upgrader. The oil sands there are at a depth of 500 m and underlie 800 000 ha around Cold Lake in northeastern Alberta. The project was put on hold during the economic downturn, but in 1983 Esso submitted a proposal to the ERCB for a staged development consisting of a number of smaller phases, each producing 1 500 cubic metres per day. To date, the smaller version does not include an upgrader. The first two phases commenced production in 1985, and construction is well underway on the next four phases, which will begin production in 1986 and 1987. Esso recently announced plans to proceed with several additional phases.

At Wolf Lake, 50 km north of Bonnyville, BP Canada, in partnership with Petro-Canada Ltd. completed the



MAJOR OIL SANDS DEPOSITS AND ACTIVE PROJECTS



first phase of its commercial project, five months ahead of schedule. Daily production is expected to reach 1 100 cubic metres this year. The project life is estimated at 25 years with an ultimate recovery of 9.6 million cubic metres.

A third commercial project, that of Shell Canada Ltd. in the Peace River deposit, received ERCB approval in 1984. Phase 1 of this three-phase project will commence production in late 1986 at a rate of 3 000 cubic metres per day.

A fourth project owned by Amoco Canada Petroleum Ltd. in the southern portion of the Cold Lake deposit near Lindbergh received approval for developmental activity. Production is expected to reach 600 cubic metres per day in 1986, with further enlargement to follow. Several other companies have announced that design work is well advanced on similar projects.

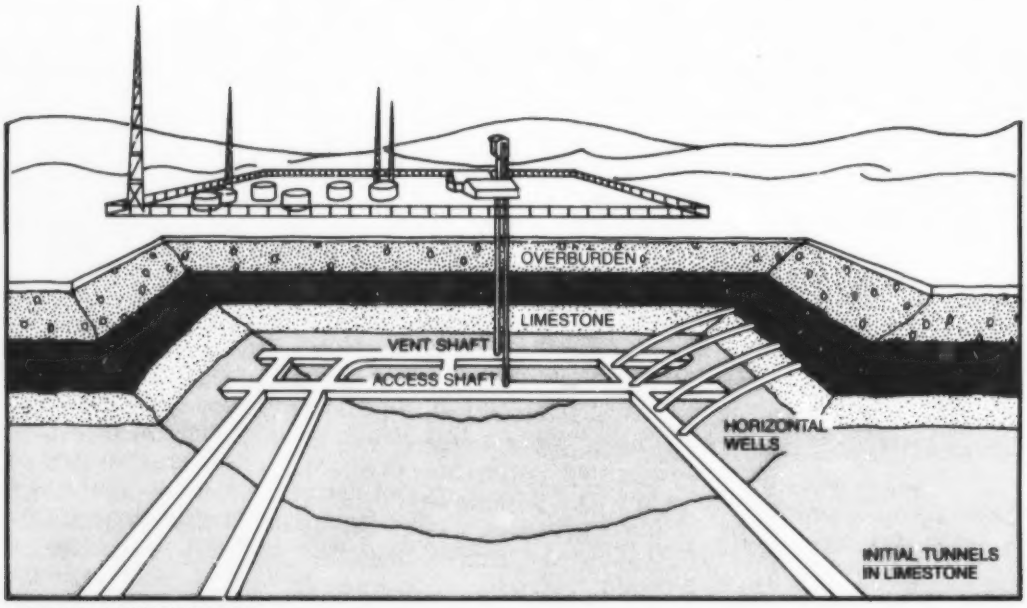
Despite concerns about world oil prices, it is important for progress to continue on the development of new technology and plant capacity, so that there can be a smooth transition from conventional reserves to heavy oil and oil sands.

It would be hard to overestimate the role of research in the development of the industry. Led by the Alberta Oil Sands Technology and Research Authority (AOSTRA), researchers are continuing the quest for methods of bitumen and heavy oil production, extraction, transportation and upgrading which would increase recovery of the resource and reduce costs, making the hydrocarbons more competitive in world markets.

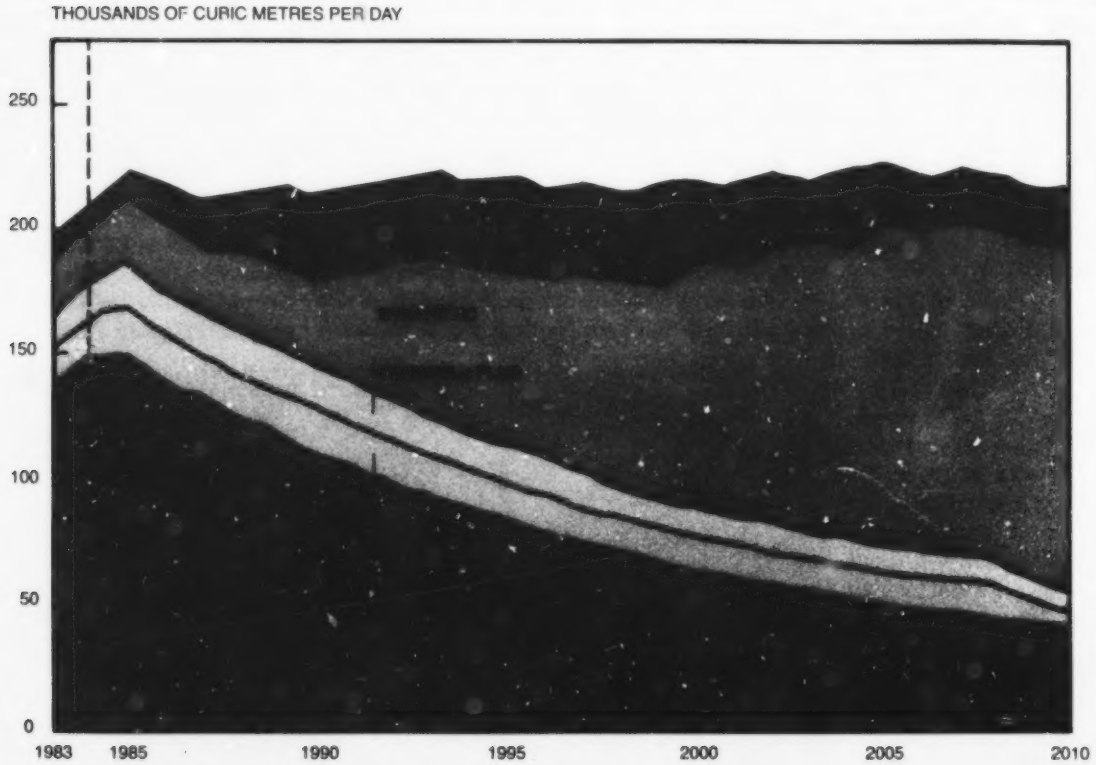
Underground Mining Research

Northwest of Fort McMurray, a new underground recovery concept is being tested. Two vertical shafts were drilled, with an interconnecting horizontal tunnel to be constructed below the oil sand formation. From this tunnel, lateral access wells will be drilled into the oil sands for both injection and production. The lateral wells will have more exposure to the deposit than do conventional vertical wells, and should be considerably more efficient. It will also allow low pressure steam to be applied and gravity gathering of the oil.

The project is being watched by industry with anticipation of future benefits. For example, as part of this research, compact drilling systems are to



LATERAL ACCESS WELLS



TOTAL PRODUCTIVE CAPACITY OF ALBERTA'S CRUDE OIL EQUIVALENT
(ALL PRODUCTS 1983-2010)

be designed to operate in the confined space, and this technology could have widespread application.

Transportation

Unlike conventional light oil, which may flow as readily as refined oil, crude bitumen varies in viscosity from a non-flowing solid to a thick syrup. This makes it impossible to transport the commodity in a traditional pipeline without some form of treatment. The currently accepted treatment is to mix the bitumen with a diluting agent such as petroleum condensate, a fairly simple process. At some cost, this condensate can be recycled, but there is a concern that the supply could be a limitation in the future. In this area, too, research is continuing.

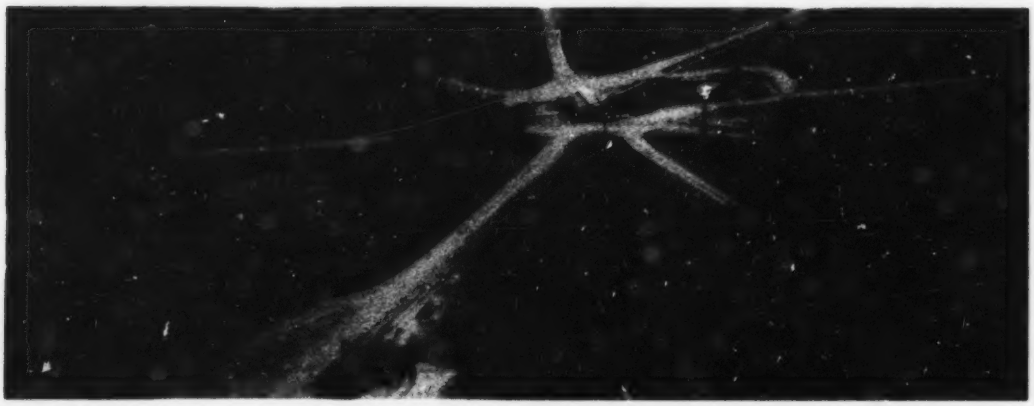
Upgraders

Upgrading can be defined as the conversion of crude bitumen and heavy oil into a synthetic oil suitable for further processing, which in turn will yield a high percentage of premium fuels such as gasoline and diesel fuel.

Many different combinations of heat, pressure, chemicals, and other process variables are used in the different upgrading processes, with the common goal of altering the molecular structure, removing carbon atoms and adding hydrogen atoms so that the resulting upgraded product more closely resembles light or medium crude oil. In the process, very often other undesirable components such as heavy metals or sulphur are also removed. For this reason, upgraded or synthetic crude oil may even be a preferred material over crude oil and command a premium price.

Upgraders presently exist at the two major surface mining oil sands projects in northeastern Alberta, and others are being studied for the Edmonton, Cold Lake and Lloydminster areas. The equipment involved is extremely expensive and the operations are quite complex, so the decision to build an upgrader is not made lightly.

The recovery and upgrading of our heavy oil and oil sands deposits is a very complex procedure. Massive investments will be required, along with a continuous and also costly program of research to assist industry and government in making the right decisions. The future of Canada's energy self-sufficiency depends on this research, these investments and the timing of the decisions that set the wheels in motion.



Committee Activity and Operations

As a liaison among government, community and industry, the committee recognizes the need to keep informed about new technology and about ongoing projects and plans for developing the heavy oil resources of the province. It must also be constantly aware of the needs of the communities in the resource development areas as they cope with the financial, social and infrastructure requirements of new and rapid growth.

For these reasons, the group has continued to meet in such centres to communicate first hand with those most likely to experience and be knowledgeable about development-oriented problems. Although the community meetings were not as extensive as they had been during the previous year, there were tours and open sessions in Lloydminster, Elk Point, Slave Lake, Red Earth and Lac La Biche.

These communities continue to view potential growth from heavy oil and oil sands development with enthusiasm, and look to the future with confidence. The committee did, however, find matters of concern that required the attention of all parties to resolve. In line with its mandate, the committee met with industry representatives, government agencies and communities, collectively or on an individual basis as needed.

Individual members of the committee have been encouraged to attend hearings and meetings within their respective areas in order to report on the current concerns of interest groups, associations and organizations. It is from these sources that the committee as a whole gains knowledge and maintains a provincial perspective. Individual or group meetings were held with a

number of groups, including the Northern Alberta Development Council, trappers' and wildlife groups, farm action committees, industry representatives and the Alberta Departments of Transportation, Native Affairs and Municipal Affairs.

Transportation continues to be a problem in all areas. In agricultural areas, roads built by municipalities for the relatively light traffic of agriculture do not stand up well to the heavy equipment traffic brought by oil development. The cost of upgrading roads is often beyond the fiscal capabilities of local authorities, and the strain on municipal budgets is of concern to everyone.

On this issue, the committee was pleased with the level of co-operation between municipalities and industries, and with the response of Alberta Transportation, which agreed to the committee's recommendations.

The Advisory Committee on Heavy Oil and Oil Sands Development feels that a new approach by government may be warranted in dealing with the transportation problems created by resource development in remote areas of the province.

The dilemma centres on whether to build new towns at the site of development activity or whether to

upgrade highway access to allow commuting from the nearest established community. New towns and communities are expensive to service, and investments in a one-resource town can be extremely risky. Further, experience has shown that workers would rather have their families live in existing communities where amenities are already established. Where new towns have been built, it has been found that paved access usually follows, with many residents choosing at that point to move back to the larger centre and commute to work. If the road is constructed first, a temporary or relatively inexpensive industrial camp site may be all that is needed at the worksite.

For this reason, the committee has suggested that consideration be given to an aggressive policy of "roads to resources", providing for adequate road access early in the life of a development.

Environmental problems constantly face the communities and industry. In recent years, most of the oil companies have established active environmental departments so that the environmental impact of a development can be carefully assessed early in the process. As well, improved communications between industry and the public has alleviated many of the problems. Industry, government and area residents have a better comprehension of all the factors required to protect the environment, and there seems to be a new openness between residents and industry on the subject.

The committee has encouraged and promoted such interchange of views and information by all parties when and wherever possible. The members feel that the best way to avoid suspicion and confrontation is to have well informed players from the very start of a project.

In the area of housing and other infrastructure, municipalities can face excessive fiscal pressure at the early stages of development. While over the longer term, benefits to the community will outweigh the financial burden, real problems can be created by the "front end" costs of extra public works and social expenditures. It has been suggested that the government play a different role in industrial tax transfer by arbitrating among jurisdictions to ensure that industrial tax revenue is more fairly distributed. For example, where a development is located outside the boundaries of the town which provides housing and other services to its workers, some provision is needed for sufficient transfer of the taxes generated by the development to meet the extra costs faced by the town.

Rental accommodation poses a special problem in some communities. The shortage of rental units runs counter to the national trend, so that government programs designed to encourage solutions when the problem was universal have been put on hold during the recent recession.

The committee has been pleased by the universal commitment by project managers to employ local Albertans wherever possible. Institutions have been encouraged to provide training to give local prospective employees needed skills. Sincere efforts are underway to employ native Albertans directly and as service contractors.

The extent of the heavy oil resource in Alberta has been fairly well delineated and is common knowledge throughout the industry. Future heavy oil development plans are not necessarily as secret as a new play in conventional oil exploration. Thus, communications between industry and the community may be more open and a closer working relationship between them may be the result. This closer relationship also serves to foster a higher level of public knowledge and concern about such issues as the impact of world oil prices and the future of upgrading facilities.

Finally, the committee would express a word of caution in viewing the future. The past few years of recession left many communities in a surplus position with regard to infrastructure and private development. This last year has seen a buoyant economy in northern centres, smoothly taking up the slack. Communities and the private sector have been very pleased to see these costly surplus inventories decreasing, but plans to expand cannot be postponed for too long. There is evidence of a shortage of rental accommodations, developed building lots and services. The caution still lingering as a result of the last few years may be difficult to shake off, but it must be done if we are to stay in tune with the industrial growth which has been forecast.

Summary of Committee Meetings and Travel

September 5, 1984 — Lloydminster
The committee held its regular meeting at Lloydminster. Representation was heard on behalf of farmers expressing concern about the close spacing of well sites in some heavy oil developments. The committee decided that encouragement of slant drilling from a central battery would alleviate this problem. This is practical in areas where directional drilling is impractical due to the shallow deposits.

The committee attended part of the heavy oil symposium and trade show sponsored by the city of Lloydminster.

November 5, 1984 — Edmonton
Following a regular business meeting and reports from all members, a meeting was held with the government liaison committee consisting of deputy ministers or their designates to discuss the provincial situation and review some of the concerns which had been received by the committee from local communities.

November 29, 1984 — Elk Point
The committee met with local municipal government representatives to discuss transportation issues such as the deterioration of municipal roads and highways used to serve heavy oil developments.

January 3, 1985 — Edmonton
The regular meeting in Edmonton included the reading and review of briefs from the Lloydminster-Bonnyville-Cold Lake triangle, regarding transportation, in order to prepare a composite brief to Alberta Transportation.

March 25, 1985 — Edmonton
The regular meeting of the Advisory Committee was held in Edmonton. The committee devoted the entire meeting to a discussion of the transportation concerns which had been drawn to their attention and the development of a presentation to Alberta Transportation.

April 24 - 26, 1985 — Calgary
Energy Resources Conservation Board representatives outlined the provincial development picture and forecasts. Committee members attended a federal and provincial government-sponsored seminar on heavy oil development at the Calgary Convention Centre, which was particularly oriented to environmental and communications concerns.

May 16 - 17, 1985 — Slave Lake
The committee had an introduction to the current developments of conventional oil in the Red Earth area and the problems of transportation and the new emerging community. Reports were received about sigrificant finds of heavy oil deposits in the Atikameg area, also within the Red Earth play. A group of Red Earth residents attended to explain the problems of a new community. Later, industry and community representatives enlarged on the problem at a reception in Slave Lake. The following day, a meeting was held with government officials and the MacKenzie Regional Planning Commission to outline the progress and problems of the isolated development.

June 11, 1985 — Edmonton
The regular meeting included reports from the members about attendance and representation which had been made on behalf of the committee with the following organizations: Cold Lake Community Advisory Committee, Northern Alberta Development Council, the MacKenzie Regional Planning Commission, AOSTRA and several government departments including Transportation, Municipal Affairs and Native Affairs.

Issues and concerns were also discussed with the government liaison committee which attended the afternoon portion of the meeting.

July 9, 1985 — Lac La Biche
The committee had a firsthand look at the Lac La Biche and Plamondon area, where runaway speculation played havoc with municipal planning. The tour included a reception with community officials and industry from the area. The regular meeting was held the following day at the community college.

August 26, 1985 — Edmonton
The regular meeting of the committee included reports from members, a thorough review of the past year's activities in preparation for publishing the second annual report and development of an agenda for the upcoming months.